

6 International Dimensions¹⁴

6.1 Introduction

This chapter uses the POLES model in order to attempt an examination of the comparative costs of emission reductions in countries and regions outside the EU. For comparison purposes, the POLES results for the EU, which is examined in greater detail in the previous chapter, are also included. As in the previous chapter, the methodology selected was to determine the marginal and total costs incurred in achieving the reduction targets by introducing a "shadow carbon-tax" in the various countries and regions identified in the model.

The model is used to construct marginal cost curves for emission reductions and then to clarify the positions of the various Annex II parties in the negotiations. An analysis then follows of the various possible mechanisms for reaching the reduction targets.

One of the conclusions is that the currently proposed "flat rate" emissions reduction framework leads to significant discrepancies in marginal and total costs, and that more differentiated solutions would probably improve the global cost-effectiveness of the mechanism. Among these solutions, those aimed at equalisation of effort (total sectoral reduction cost/GDP) in the various countries would come closer to the marginal cost equalisation optimum. They would thus

¹⁴ This chapter was initially prepared as a contribution to the EC pre-Kyoto process. Since then, emission targets have changed. There has also been additional information since then, which has been incorporated into POLES and which has affected somewhat the model projections. However, the approach used in this chapter concerning the principles of the cost reduction curves and their analytical implications remains valid. The principal writers of this chapter are Patrick Criqui of IEPE and Niko Kouvaritakis of ECOSIM.

offer "second best" possibilities, perhaps more readily acceptable to the various parties.

The analysis proposed here fall within the realm of the cost-effectiveness analysis of emission control strategies. A global but sectoral approach has been adopted, since the analysis is based on a model of the world energy system up to the year 2030, the POLES model. In the first part, we present the main characteristics of the model used followed by an analysis of the limits as well as the interests of a sectoral approach to the problem. In the second part, we present the results of an assessment of sectoral emission reduction costs. To this end, the "reference projection", corresponding to a scenario "without new policies", is analysed. The concept of a "shadow carbon-tax" is then used to calculate the sectoral marginal costs of reduction, differentiated by region. Finally, in light of these costs, various plans incorporating quantitative objectives and different distributions of the emission reduction effort are analysed and an attempt is made to determine the consequences for current negotiations on greenhouse warming.

The POLES model analysis of the cost of international strategies to reduce emissions is carried out in two stages:

- first, by defining a reference or baseline scenario representing changes which might be expected in the energy situation without these strategies;
- next, by examining the results of a series of alternatives, corresponding to different shadow carbon-taxes representative of the various levels of effort to reduce emissions.

In Chapter 2 the characteristics of the baseline scenario and the key results were presented. It was also seen in that chapter that the baseline results, at least for CO₂ emissions, are reasonably consistent with those of other world energy forecasts. The remainder of this chapter describes in detail the results of the alternative scenarios, which incorporate a shadow carbon-tax. The chapter concludes with an attempt to use these analyses to draw up guidelines for the formulation of international objectives and strategies to combat the greenhouse effect.

6.1.1 Limits and Interest of a Sectoral Approach to the Evaluation of the Reduction Strategies

Structuring the Economic Debates within the Framework of the IPCC

Most of the studies undertaken within the framework of Group III of the IPCC (socio-economics) have used a "cost-effectiveness" approach, involving the analysis and comparison of the results of various emission control cost studies (IPCC, 1995). Debates have focused on two questions, that of the extent of low- or